Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences
Maritimes Region
Canadian Science Advisory Secretariat
Science Response 2014/004

# WESTERN COMPONENT (4XOPQRS5) POLLOCK HARVEST CONTROL RULE UPDATE REPORT

## Context

Pollock in NAFO Areas 4VWX5 comprise two population components: a slower-growing Eastern Component including Divisions 4V and 4W, as well as Unit Areas 4Xm and 4Xn; and a faster-growing Western Component (WC) including 4Xopqrs and Canadian portions of Area 5. The WC has been the main focus of past analytical assessments but scientific advice on stock status and catch limits using Virtual Population Analysis (VPA) modeling has been highly variable, especially since the mid-2000s. For example, the 2008 assessment indicated that age 4+ population biomass was at 27,000 t (Stone et al. 2009) while the 2010 assessment update indicated 4+ population biomass was either 23,000 t or 17,000 t, depending on whether the very low 2010 DFO Research Vessel (RV) survey indices were excluded or included from the analysis (Stone 2011). Consequently, the Canadian fishing industry recommended exploration of alternative approaches which would provide more stability in future catch limits to allow for better business planning and a more stable fishery.

Recently, fisheries managers and the fishing industry decided to manage WC Pollock using a risk-management approach and embarked on a Management Strategy Evaluation (MSE) process, with the help of government scientists and outside experts (DFO 2011). MSE is a technique to explicitly consider the uncertainty in stock assessment assumptions and models, and to compare the likely consequences to Management Objectives when a predetermined Management Procedure (MP) incorporating a Harvest Control Rule (HCR) is applied. The Pollock MP was selected on the basis of satisfying three medium-term objectives agreed upon for management of the resource which relate to sustainability, catch levels and the extent of annual catch changes. The MP model was built around a HCR which either increased or decreased future catch limits based on results from ongoing monitoring from the annual DFO summer RV survey. An Exceptional Circumstances Protocol was put in place to cover situations which fall outside the range for which the MP was simulation tested and, if necessary, to allow for some form of intervention.

Recently, Fisheries Management posed the following question to Science: What is the Western Component catch level for fishing year (FY) 2014-2015 generated by the Harvest Control Rule described in SAR 2011/054 "*Western Component Pollock Management Strategy Evaluation*"? This report provides advice on the FY 2014-2015 catch limit generated by the Pollock MP and HCR using updated information from the 2013 summer RV survey and describes current status with respect to the provisions in the Exceptional Circumstances Protocol. The HCR with updated monitoring data generated a catch limit of 3,072 mt for FY 2014-2015, down 20% from 3,840 mt for FY 2013-2014. The RV survey biomass index increased from 5.28 kg/tow in 2012 to 23.45 kg/tow in 2013, and avoided triggering the exceptional circumstance provision of the RV survey biomass index being < 6 kg/tow for two consecutive years and the Survey Index Ratio being < 0.2.

This Science Response Report results from the Science Response Process of 9 December 2013 on the Western Component Pollock Harvest Control Rule Update Report.

## Analysis and Response

### DFO Summer Survey Index

The DFO Summer survey time series for the WC Pollock biomass index (kg/tow) extends from 1984-2013, a period when the same survey vessel (CCGS Alfred Needler) and bottom trawl (Western IIA) have been used annually (Figure 1). The index is based on survey strata representing unit areas 4Xopqrs+5Yb and does not include 5Zc (eastern Georges Bank). The biomass index exhibits strong year-effects which reflect the semi-pelagic schooling behavior of Pollock and changes in availability arising from differing distributions in the water column at the times of the survey. In general, there has been a declining trend in the index since the late 1980s, an increasing trend from 2003-2007 followed by another decline to 2012 with an increase again in 2013. Although the index is highly variable, the long terms tends are important. The RV series using a 3-year geometric mean (GM) (three-year moving average) provides a better impression of long term trends by removing year effects and provides the monitoring data used in the HCR for calculating future catch limits (Figure 1).

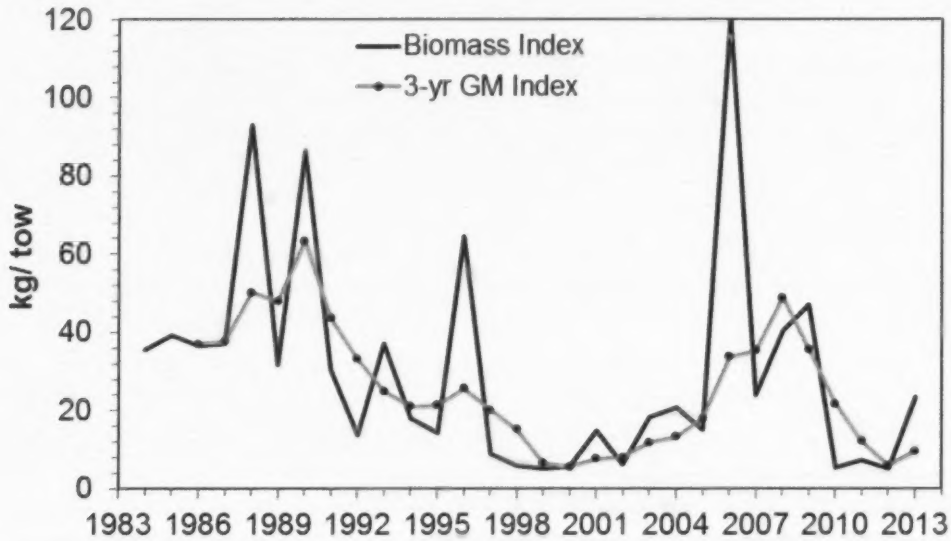


*Figure 1. DFO Summer RV survey biomass index and 3-year geometric mean (GM) index based on survey strata representing unit areas 4Xopqrs+5Yb, 1984-2013.*

### Harvest Control Rule

The Pollock MP is linked to the HCR to calculate catch limits based on results from ongoing monitoring (Summer RV Survey). The catch limit either increases or decreases by up to 20% (with increases capped at 500 mt) depending on the value of the GM biomass index for the most recent 3 years (i.e. 2011-2013) as a proportion of the GM of the index for 1984-1994, a period of high productivity (also referred to as the Survey Index Ratio). The catch limit was initially set at 6,000 t in 2011 for the Pollock MP Model. The survey biomass index increased from 5.28 kg/tow in 2012 to 23.45 kg/tow in 2013; however, because the index was very low in 2011 (7.31 kg/tow) and 2012 (5.28 kg/tow), the 3-year GM value for 2011-2013 shows only a modest increase to 9.67 kg/tow and the resultant Survey Index Ratio is now at 0.27. Based on this value, the HCR calculates a catch limit of 3,072 mt for FY 2014/2015, down 20% from the 3,840 mt catch limit calculated for FY 2013/2014 and 4,800 mt calculated for FY 2012/2013.

## Exceptional Circumstances Protocol

There are provisions to cover situations outside the range for which the Pollock MP model was simulation tested (or correspondingly beyond situations that the management procedure was designed to handle). These provisions can be applied by decision-makers to amend the catch limits set by the Pollock MP or to revise the MP itself but should not be a frequent occurrence. They are based on unexpected results (up or down) from monitoring data (i.e. RV survey biomass index).

Results that would trigger an exceptional circumstance based on the protocol established in DFO 2011 include:

***1. When the Survey Index Ratio falls below 0.2 or is beyond 90% probability level from model predictions.***

The current Survey Index Ratio (based on the 3-year GM survey index for 2011-2013 as a proportion of the index for 1984-1994) is 0.27 which is above the exceptional circumstance value of 0.2.

***2. When the RV survey biomass index is < 6.0 kg/tow for two consecutive years.***

The RV index was 23.45 kg/tow in 2013; 5.28 kg/tow in 2012 and 7.31 kg/tow in 2011, which does not trigger an exceptional circumstance.

***3. Additional situations.***

RV survey age-specific indices are monitored for changes in age structure which could also trigger an exceptional circumstance (i.e. when extremely compressed/expanded). There has been a period of diminished numbers at age for older ages from 1995-2005, with some modest improvement since then (Figure 2). While the recent age structure indicates that there are few fish in the population older than age 7, there has been a notable increase in the abundance at age for all ages in 2013, compared to the previous three years, and an indication that the incoming 2011 year class (age 2) may be above average.

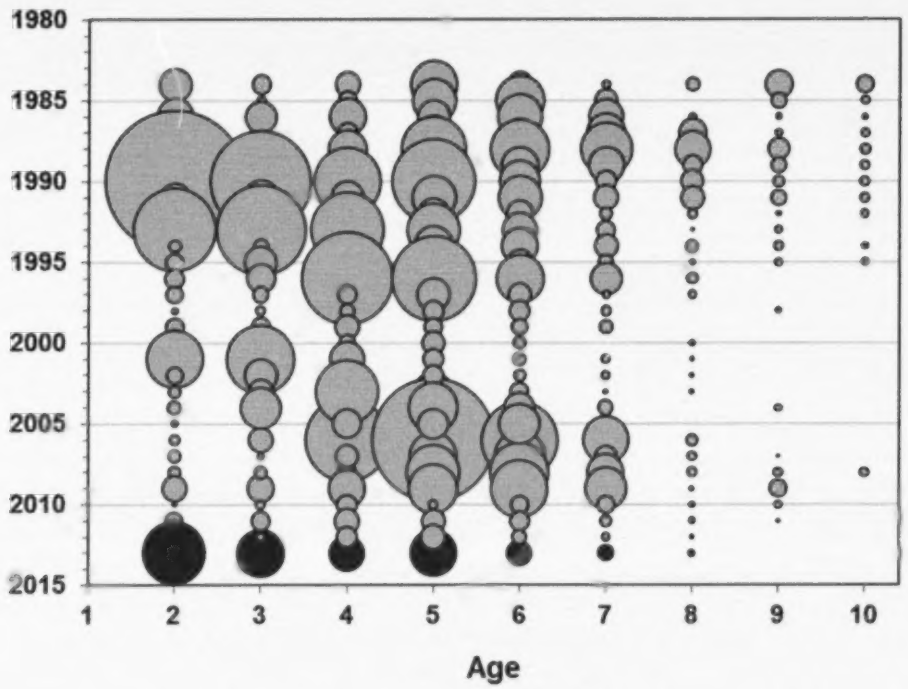


*Figure 2. Stratified mean number per tow at age for Pollock from the DFO summer RV survey based on strata representing unit areas 4Xopqrs+5Yb for ages 2-10, 1984-2013. The index values for the 2013 survey are shown in black. (Bubble size is proportional to the stratified mean number per tow at age).*

## Conclusions

Using updated monitoring data, the HCR calculates a catch limit of 3,072 mt for WC Pollock for FY 2014-2015. If the summer RV survey biomass index for WC Pollock is greater than 10 kg/tow in 2014, then the catch limit will start to increase again. Although this update is not entirely positive, the exceptional circumstance provision has been avoided and so there is no need to review the MP model at this time.

The Pollock MP and its HCR have responded to declining trends in the survey biomass index for WC Pollock by bringing the catch limits down over the past few years. Unless an Exceptional Circumstance is triggered, application of the MP will provide the catch limit for WC Pollock until 2016, after which there will be a thorough review, including a re-evaluation of the Reference Set of Operating Models to ensure they reflect current stock dynamics. At this time, Fisheries Management, Industry and Science can address other issues such as additional biomass growth and further recovery. Management Objectives will also be reviewed, in particular the trade-offs between catch and sustainability.

## Sources of Information

DFO. 2011. Western Component (4Xopqrs5) Pollock Management Strategy Evaluation. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/054. 15 p.

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